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# ON THE EFFICACY OF CONSCIOUSNESS

VIEWING conscious creatures from a purely objective point of view the most general facts which may be observed as surrounding their conscious lives seem to be that they move, grow, nourish, reproduce, and die. Of these phenomena movement is the constant factor and so becomes the one upon which finally reliance is placed as giving evidence of consciousness. The double correlation of Professor Morgan, first, between the individual's own activities and his observed conscious states and, secondly, the inference from others' activities which are like his that their movements are correlated with conscious states, such as he observes in himself, is the mode of procedure here relied upon. Those beings which may be generally allowed to share in consciousness present a graduated series from low to high, or from simple to complex. If, now, comparison is made between the conduct of the creatures which form the extremes of this series, certain facts present themselves. The life activities of the highest are not so narrowly circumscribed. The highest have the widest geographical distribution; they are able to live under the greatest variety of environmental conditions as regards heat and cold, elevation above, and even below, the sea-level, and wetness and dryness of atmosphere. In general terms their habitats are not absolutely fixed by geographical and climatological conditions. Their wider distribution means more adaptability, a greater power to accommodate their activities to outer conditions. They have a higher capacity to make use of extra-bodily materials for clothing, shelter, instruments of offense and defense, and for purposes of transportation. Their reproductive power is very much lower than that of other animals. This, combined with the other features, makes necessary the more ready adjustment to surroundings which they show. The lowest form of adaptation is organic and suitable to the preservation of species and races. Natural selection is the method of racial adaptation, and is adequate to meet the requirements of slowly changing environments. In the development of life, this demand for quick adjustment seems to have been met at first by the plasticity of instincts, but this is still inadequate, for individuals as well as species must be adapted. In individual adjustment conscious adaptation is required. The first example of this is found in habit formation, but the formation of a habit takes repetition long continued. And then habits become stereotyped and so, when further changes during individual life are necessary after the habit is formed, the habits are as unsuitable as most of those organic adaptations which in case of maladaptation call for the administration of the death sentence. Consciousness in the form of thought or thinking alone could suffice. The steps in its development and the method of operation we will now proceed to set forth.

By comparing the conscious being with the unconscious, or a given organism during conscious activity with the same organism in a state of unconsciousness, certain objective differentiæ of consciousness may be made out. Let one take careful note of the process of passing into sleep or under the influence of ether. There is first a subsidence of activity in general and then the disappearance of tone from the muscles. The latter departs from the most refined muscular groups first and then from the others in the order of their refinement. Waking up or coming to after etherization is marked by a return of tone to the muscles, and sometimes the order of reappearance may be made out to be the reverse of the order of disappearance. Muscle tone is a form of incipient muscular contraction. The motor centers are constantly discharging into their efferent neurones, and the activities of the muscles tend to excite returning currents to the central system. Section of the motor nerve causes a disappearance of tone, and section of the sensorial nerve works its disappearance in a similar manner, but not to the same extent. The sleeping person and the anæsthetized patient show only the minimum of muscular activity—respiration and circulation. The other muscle groups assume positions determined only by the force of gravity and their own elasticity. Professor Ribot makes the sameness in the feeling of self depend upon the constancy of the content in the streams of afferent currents which are always welling up from the bodily organs. Let any change take place in this flow and the sense of self identity is altered. The mechanism underlying muscle tone and bodily equilibrium consists of a motor center with its afferent pathway which is constantly discharging into the muscles, exciting incipient activities in the muscles. These, in turn, stimulate the sensory nerve endings in and about the muscles, and so set sensory currents flowing which reinstate central excitement. This is the circular activity of Professor Baldwin. The strength of this excitement often falls through fatigue and other influences by the law of subtraction of effects until sleep ensues. The rhythmical movements of wild animals in captivity, and the repeated activities of feebleminded children, as well as the motor automatisms of normal persons, seem to indicate that the process underlying muscle tone in some organs may rise above the level of the incipient stage. Such movements serve to stoke the cerebral fires when the degree of activity tends to fall too low. The appearance and disappearance of consciousness, however, synchronize pretty closely with beginning of tone and equilibrium and their recession.

Viewing consciousness more narrowly and in the light of the observations which the introspector may make, it appears that consciousness is now of one thing and now of another; it changes ceaselessly in its content. It is constituted of a stream of varied thoughts. The stream may be slow or rapid, deep or shallow, and broad or narrow. The images are sometimes clear, sharp, and distinct, and, again they are dim, vague, and without boundaries. All these words are simply figures of speech drawn from things. Since Professor James issued "The Principles of Psychology," the figure of a flowing stream has prevailed over others, and it sometimes seems to express a literal rather than a figurative truth. It, however, scarcely covers all the aspects of consciousness that present themselves to the observer. Consciousness seems at times to be on the lookout—to be alert. This phase seems to have impressed practical people, for this idea of searching is contained in the word attention which has come to be applied to this as well as the other phases of consciousness here mentioned.

On the objective side what may one observe as the accompanying phenomena in activity? If one "turns his attention" to an object and fixes it with his eyes or holds it in his hands, he finds that his eyes fixate now one point of the object and now another. They do not remain for more than a few seconds upon any given point. If he takes the object in his hands, he fumbles it, presses it, rubs it, and passes his fingers or palm over its various contours. Consider for a moment the experience of watching the figures in a wall paper or holding a bunch of keys in the hands. The various stimulations given by the object arouse different mental images of its parts or associates of the objects as a whole or of its separate parts. Now let us say that the lines and colors of the wall paper seem to suggest that the vertical lines converge. Immediately these lines seem to stand out clearer and examination is made to discover if this convergence is true or illusory. The eyes then fixate a given point and the whole body assumes an attitude which aids the process of visual examination, and so the process of changing fixation begins again immediately. If one slips the keys around his key ring and one of them sticks fast, then the movements of the fingers seem to be so directed as to shut out everything else and increase the efficiency of the fingers which are now trying to slip the key along. The mental image of the lines and of the obstinate key becomes especially clear and sharp. In all these cases there is a carefully adjusted group of muscles which are about to undertake a work, and all the other muscles of the body assume positions to aid the one group in its work. If one lifts with the hand, the body braces itself that the lift may accomplish most. This may be called the attitude of effort which is correlated with attitudes of attention. The origin of this attitude is found in the instinctive activities of curiosity and of stalking. Manifestly in these are to be found the beginnings of the attitude of attention, but the term ''attitude of attention'' implies too much. The inference is that the attitude is the outcome of a state of mind. Rather is it a deep instinct in animals and the particular manner in which work is done among men. Some organ of the body is preparing for functional activity; it adjusts itself, and at the same time the general muscular organism joins in the support of the one about to function. Here is unity of action among the organs of the body, which is a general law of bodily activity; and a similar law is found to be true of conscious activity. The two unities are correlated.

Every process of attention is based upon the condition of action and reaction between the brain and some sense organ or group of muscles, which is only a special form of the neuro-muscular process underlying the tone of the muscles. When an object is attended to there are running off in the neuro-muscular mechanism currents of exceptional strength which in one direction come from the object and in the other from the central system. To have an image of the object is to have some sense organ active, setting currents flowing centripetally, and some brain processes of greater strength flowing in the opposite direction. Both must rise above the level of the tonal currents and must be prepotent and persistent. Such currents, both afferent and efferent, were first elicited when serious dealings were had with the object. Several such processes may exist at a given moment, but in different degrees of intensity. Each would involve a different sense organ or motor mechanism. General attention means no more than that the action and reaction are more widely distributed. Consciousness—being awake—is due to this process in a still more general form. To be conscious is to be subject to just such a ping-pong of recurring nervous activities that effect muscle tone on one side and brain discharge on the other. To be conscious of the things around one is to have mingled in the general ebb and flow of neural processes the weakened survival of the currents that were first active when acquaintance was had in the serious dealings with all these things. If there be one thing around us of which we are not aware, there is no trace of the happenings that were awakened when its acquaintance was first made. The consciousness of an object means that the currents set agoing when it was met are joined as a predominant activity with innumerable other systems. When this one ceases to be predominant another from among the mass assumes the rôle, so that there is a constant shifting from one predominant process to another.

The object which is first only stimulus is constituted,—gets meaning—by the conduct one displays in the presence of the object. The eyes and hands make movements about it, or the object is handled and fumbled before the eyes. The object's presence is accompanied temporally by an image. This is the meaning of the object in one aspect. The image may be present later when the object is not. The view that is gaining some ground through the general influence of physiology and biology—the first with its concept of the reflex arc; and the latter with its theory of the origin of reactions—is that the object is just the thing that invites these reactions, and the reactions find their meaning in the object that evokes them. Every object invites activity, and the activities reconstitute the object. The situation of an object exciting a recurrent afferent flow towards the brain, which in its turn discharges downward into the sense organ, producing the movements for surveying the object, is felt in consciousness as an image. The image present in the absence of the object means that there is a weakened survival of the afferent and efferent currents which were aroused in the actual dealings with the object—when it was perceived. These incipient reactions may often be felt by sensitive persons, especially by those in whom images are most vivid. The meaning of an object is given when the neuro-muscular process that has supported the image passes over into the processes which give the next image. More of meaning will be given when this process survives as a background for several succeeding images, each successive image containing this as a part of itself. The fullest meaning, or images with the fullest meaning attached, are those which seem never quite to disappear. Their neuro-muscular processes are subordinate factors at all times. The meaning is, then, that of mental unity and mind-set.

Consciousness is antecedent to or correlated with some activities, and with some it is not. The traditional division among movements is here into voluntary and involuntary. Another division is that of voluntary and automatic or reflex. Genetic psychology presents a similar distinction by the words, controlled and non-controlled or uncontrolled movements. Voluntary and controlled belong together, and both terms imply the presence of consciousness—of images and ideas. The involuntary, automatic, reflex, and uncontrolled belong together, and as such they are without conscious correlate. Consciousness of an action may precede the action in many different ways. The bare presence of an idea of a movement in the mind may precede and seem to cause the movement. Such a movement is generally voluntary and yet it is scarcely under control. Consciousness of a movement may mean that the movement which is to be executed has been decided upon after deliberation, and a special fiat has been issued that it shall forthwith be made real. The movement may be a part of a plan which is to be carried out, and hence care must be taken that there shall be no miscarriage or defeat of the plan.

When movements are considered objectively—studied with regard to the differences that can be made out among them—it is found that some follow the exciting stimulus closer than others, some repeat themselves with the smallest degree of variability, some show a striking tendency to recur in regular sequence and, when once excited, they unfold themselves in an invariable order and brook no interference, retardation, or delay; they proceed directly to their goals. In contrast with these there are movements that follow their real initiating stimuli at indefinitely long intervals; they repeat themselves with no regularity and with extreme variability. When they begin, they tend to stop, begin again, change direction, are accelerated and retarded, and finally reach their goals only after much hesitation and delay. The first are generally allowed to be reflex and automatic, and the latter are called controlled, attended, or voluntary movements.

Examples of controlled movements are to be found in the attempt to set a fairly heavy weight down upon a table or in seeking to make one's way across a dark room and out of the door. Both of these are cases of making movements in view of a plan which, in the first, is an image of the table with the weight upon it and, in the second, it is an image of the door with oneself passing through. In setting the weight down the movement of the hand is at first slow, perhaps, then more rapid, then retarded, again accelerated, checked, started a third time, and so on until the weight meets the table. In going out of the door one begins by groping with hand or foot. He then takes a step, or perhaps two, and begins to grope again. The method is that of "feeling one's way." As soon as one gets a stimulus of way clear, he plumps right into activity, only to be checked up and to wait for fresh data to be given. The last stage results from tactual stimulations either from the door-knob or from the door-jamb, eliciting random movements by which the body is finally guided through. The method in the first example may be called the method of successive approximations, and it is only a special form of the method of random groping which appears in the second. Professor Woodworth found that voluntary movements were more irregular and slower than automatic, and they were over-appreciated. Attention to movements is found to have similar results upon the movements. In all these cases there is an end or goal to be attained. This amounts to a plan for the movement itself; it is an image of it. With the appearance of the image the movement begins to unfold itself. That arises from the very constitution of the image. The image is inseparable from the movement. As soon as the movements begin, through their kinesthetic consequences they are checked up on the plan to see whether they tally or not. These movements will continue until their results tally exactly with those contained in the image. If there should arise at any time any lack of coincidence between the two, the movement is stopped, a period of random change for the purpose of redirecting the movement ensues, and as soon as they coincide the movement is begun again. This accounts for the interruption, hesitation, and delay. After movements have been gone over a number of times they may unfold themselves in that invariable order that is the mark of the automatic. Movements to be highly serviceable must take on this character. The invoking stimulus must bear a high degree of probability that it is true to the situation, or the first indications of an object's presence must be right if it is to be acted upon automatically. When an attempt is made to carry out a voluntary movement, it is set before the performer as an image or it is charted. When the needle shows a deviation from the chart, the helm is put down and held there until the actual course is the same as that upon the chart. If no image is present, any stimulus to activity will cause the action to proceed directly to its goal without hesitation and delay. When an image appears the movement is checked so that its consequences may be noted.

The fiat is in the nature of a further plan lying back of the plan of the movement. Such a plan calls for the continued recurrence of the other plan in view of the kinesthetic results of actions that are being executed. Each action is a variant of the preceding, and each invites another and another until the image of the action shall have been realized in the motor consequences of one of them. The plan of the fiat is the first plan realized. This bears close resemblances to the process of getting meanings which has been presented.

Voluntary action presents itself in its double aspect as an image of a movement—a chart of activity—and as a series of hesitating, irregular, and rambling movements that are being checked up on the chart with a view to making the results coincide with the chart. Such results are obtained by holding up the chart, so to speak, and checking up the motor outcome of movements which are being carried out through successive approximations and by varied and fumbling activities. This idea of a chart upon which a log is being written is the crucial moment in voluntary action.

Now for the process of learning. It is generally held that consciousness is present during the learning of a movement, whether of the body in general or of the speech organs in particular and, when the movement is acquired, consciousness forthwith deserts it. A careful description of a movement thoroughly learned and the same movement in the process of learning should show the method of the learning process. The movement that is in the process of being learned is rambling, hesitating, uncertain, and varied. It has all the characteristics of the voluntary action. The learning is accomplished by starting the movement, stopping it, and then redirecting until it reaches its goal. In fact the learning proceeds by noting the various stages, and when it is not going according to plan, it is redirected by varying it until the necessary coincidence is found. When it has lost all its hesitation and uncertainty and unfolds itself in rapid and regular sequence, it is learned; it is then automatic.

Learning is of two kinds, of thoughts and of actions. The introspective observer remarks the presence in his stream of thought of new images or fresh and unfamiliar ideas, and the objective observer discovers new kinds of movements or new combinations of movement. Unfamiliar images enter the stream of thought by way of perception and imitation. Imitation may be of two kinds, imitation of another and self-imitation. New movements or new combinations of movement present two varieties; let us call these vicarious acting and conceptual acting. Under the first are included all those forms of acting where the substitution of another for the original exciting stimulus to an action takes place. Most forms of animal learning fall under this head. This is the associative memory of Professor Morgan. In conceptual acting a given object may invite a great variety of movements and a great number of objects may come to elicit one and the same response.

In perception an object is set up before the reagent. It elicits a variety of responses in the organ of sense. If it be the eye that the object appeals to, the eye begins to survey it. Each part of the object is fixated in turn. To fixate means to set up in vigorous form the general conditions of muscle tone and attitude of attention which have been described. The mechanism of muscle tone is set to functioning in some direction with prepotency. The object excites the nerve endings in the sense organ, the afferent nerves excite the central centers, and these discharge downward, provoking movements of adjustment now for one part of the object and now for another. This shuttle-like action maintained for a moment is the condition under which the introspector observes the image. Several presentations of the object give the image the character of a recognition, and later the conditions may be so maintained that the image may be felt when the object is not present at all. It is then a memory. Further perception or repeated perceptions tend to bring out more and more detail because more of the actual points of the object are fixated. The object is in reality the plan which has been described before, and the sense organ is making movements which are being checked up on it. When the image gets the character of a memory, it may serve as a plan on which the movements may be further carried out. In the imitation of another the same essential conditions obtain. The exciting object is another person who moves arms, facial muscles, or speech organs. This serves as the model. Such a situation provokes random activities. When the activities of the subject coincide with the activities of the object-person as a plan, some other part of the person's movements become the exciting cause. This random movement continues until the activities of the subject fall in with the model set before him. In self-imitation the model is an image internally felt. Out of this as a stimulus random movements and activities proceed, the kinesthetic or other consequences of which are charted alongside of the image as a plan. When these coincide, activity ceases. The coincidence reproduces again the conditions of muscle tone, that is, the image gives rise to actions the felt consequences of which are a reproduction of the image. Self-imitation arises when some association, suggested by words, objects, or movements, throws into juxtaposition the old and familiar images of consciousness in such a way as to form new combinations. Such a situation invites random discharges just as a fresh stimulus would do. This is the field of ordinary thinking; and it may be remarked that ideas are given to random and varied changes just as activities are in spontaneous movements. However the changes may come about, any new combination of images is likely to set up varied activities until the combination is realized in action. The varied changes among ideas may find their rest and satisfaction in coherent systems of ideas. In this case ideas coincide with themselves, one idea serving as a plan for others. Wherever a plan, chart, model, image, or idea appears, it is due to a self-sustaining and self-repeating neuromuscular process of afferent and efferent currents that echo themselves back and forth between the central system and some motor mechanism. In the more complex thought the peripheral end is found in the vocal cords and perhaps in the fingers for writing.

Movement-learning through vicarious functioning is perhaps the largest and most important class of learnings. It plays the chief rôle in animal-training and it is always an important factor in the education of human beings. The mechanism of muscle tones here undergoes a peculiar modification that is of the highest significance. It will best be seen in an example. While chickens are excitedly eating and searching for food that is scattered before them, let one call out in any manner whatsoever or beat upon a pan or other object. After a few trials the call or beating noise will invite the activities of searching for food. The movements of eating and searching set agoing afferent currents from the muscles and these reinvite the activities of the central centers. At the same time afferent currents due to the sound are coming in from the ear. These associate themselves with the afferent currents from the muscular activities and soon acquire the power of initiating the activities of searching which have been initiated by the searching activities themselves. This process gets further extension in the learning by conceptual acting.

Again resort is had to an example to introduce the subject of conceptual acting. The office boy comes to the gate that has received a new lock since he left the office. He seizes the little pin which, being slid back, draws the bolt. The pin on the new lock is a mere blind. He draws upon it without result. Now he presses it in, pulls it out, pushes it up, down, forward, and back, and still there is no result. He now takes hold of the lock by placing his fingers about it; he presses here and there and runs his fingers along the side. At last one finger hits upon a piece of metal on the under side which, by being pressed upward, draws back the bolt. He feels this movement and he repeats it in an experimental way several times, noting the result (these are the conditions for image forming). The next time he approaches the gate the hand is thrust out with the finger properly crooked to reach the bolt without the former random endeavor. Passing by the features here which have already been pointed out as elements in the learning process, it should be noticed that the movement for drawing the bolt has been represented—an image of it has been built up. The boy presents to himself the lock with the movement associated with it, when the lock is not yet there. The lock is the thing that will awaken this representation through which the movement is called out. The lock has taken on that degree of probability of its ultimate character which renders possible its being treated in an automatic way. The power of representing the thing with its appropriate response is responsible for the speedy adjustment. The power of representing the thing with its appropriate movement is of little value in actual experiences, and it is dispensed with whereever it is possible to do so, as the boy did, by developing an automatic response. But let it be supposed that locks of both these kinds are kept in use and their external appearances and surroundings are the same. Then when one approaches a lock, there is nothing for him to do but to employ this learning process through random endeavor. This means hesitation and delay, but the learning process is not very serviceable in actual situations; its function lies in preparing for them beforehand. If the two locks are known—have been represented and acted upon in the represented plan—the individual coming to it may think of it as belonging to one of the two types—the lock is conceived as this—and then he acts suitably upon it as such. If now the lock experienced does not tally with the lock as conceived, he may conceive it in the other form and then act upon that in the manner suited to it. One may see that this is the same as the process of checking movements up on a chart. The example of the boy learning the combination of the new lock may be treated in this wise. When the boy saw the lock, he set it before himself as of one kind and acted appropriately to such a lock and awaited the outcome. When the lock did not work, he set it before himself as of another kind and acted appropriately to that. He continued in this way until he conceived it in the right way and so found the movement that opened it. The method here is that of random thinking—thinking in succession the various kinds of locks that are known. Both methods—random acting and random thinking—are employed in such cases, and it is not entirely clear which he may have used. However, as it is probable that both animals and young children make use of the method of random acting, the boy has employed it here. The other, however, is the method employed in most scientific investigations. Objects that are met with are conceived first in one way and then in another, and the movements appropriate to each are carried out in succession until one is found that will fit the case. But investigation can proceed in the opposite way. A given concept may be taken and search begun for objects that can be conceived in the manner of the concept. Both methods are only other ways of stating the last of the two named characteristics of controlled movements—a variety of movements can be made upon one and the same object, and a variety of objects can be acted upon in one and the same way. Both processes are accomplished through the power first to represent objects by images when they are actually present, and then to represent them when they are absent and to execute movements appropriate to them as so represented.

Just one more point, and that concerns a direct introspective analysis of the particular moment of thought or consciousness. The description given by Professor James of the empirical thought process is still so complete and adequate in most respects that little more need be done than to reproduce it to satisfy the purposes in hand. The empirical mind presents to the introspective observer a succession of thoughts in ceaseless flight one before the other. Each thought as it presents itself thinks and in thinking feels itself the same with the thought that has just gone before. Having thought and thereby having been thought, the thought takes its place beside the other thoughts as belonging with them. Each thought thus changes right here from a thinker to a thought, from a representing to a represented thing. Just in the moment of thinking the thought splits into a thought that is object and a thought that thinks and represents. This division into a representing and a represented process is the particular differentia that runs throughout all of mind's operations. The thinker can then be with an object or represent it to himself in its absence. When a reality can appear both to be and to be represented at the same moment, when a thinking being can be with a thing and be away from it at the same moment, this must be looked upon as a variation of a biological sort that confers upon the possessor an advantage of such transcendent importance and value as to place all other creatures out of the running with him. The animals that took on these changes beat the others and have come to possess the earth through just these means, and the world is rapidly passing into the hands of those who have the highest degree of facility in representing things that are not present to them at all. In this very fact is displayed the chief characteristic of mind; it is the power to represent things that are not present and to act upon them just as if they were. In that way the animal organism may learn to act with perfect automatism upon things in their absence, so that when it is necessary to deal with them seriously the appropriate act is there. The preparation has been made beforehand, and this is the peculiar efficacy of consciousness. The steps by which this has been attained are the shuttle-like activity of the afferent and efferent currents in maintaining muscle tone, the heightened intensity of these in the attitudes of attention, their steady maintenance in the formation of the image, the indendent upholding of this image while the motor results of movements are checked up on it, the image as a chart by which activities are directed, stopped, and redirected, the image as a further plan upon which other images are charted in the resolved acts, and the image as a representation or conception by which various actions are carried out in succession. Images, ideas, thoughts, and representations are the individual elements of consciousness which may be observed and classified by the introspector of his own consciousness. The objective observer may note various activities and changes of movement, and the two observers may correlate these movements and the forms of consciousness. The various forms of movement and the changes taking place in them are due to the mode of operation in the mechanism just reviewed. Movements that are correlated with consciousness differ in characteristic ways from movements that are not so correlated.

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